BLADE TENSIONER

Field of the Invention

The present invention pertains to a blade tensioner, and particularly to a blade tensioner provided with a blade shoe having a chain sliding face and several plate-like blade springs for applying spring force to the blade shoe.

Background of the Invention

A blade tensioner is often utilized as a tensioner for applying tension to a chain. A conventional tensioner may be generally configured with a blade shoe provided with a chain sliding face, a base which allows a base part of the blade shoe to pivot freely and a tip part of the blade shoe to slide freely, and several plate-spring-like blade springs stacked on the reverse side of the chain sliding face of the blade shoe in order to apply a spring force to the blade shoe. Respective edge parts of the blade springs can be inserted into slots created at the tip part and the base part of the blade shoe.

During the operation of the chain, the chain may run while sliding on the chain sliding face of the blade shoe. At this time, a pressing load can be created as the blade shoe and the blade springs are deformed and acts upon the chain, so that constant tension of the chain is maintained. In addition, chord vibrations caused by thrashing of the chain and/or fluctuation of tension can be propagated to the respective blade springs in the blade shoe via the blade shoe. At this time, when the respective blade springs are subjected repeatedly to elastic deformation and return deformation, a damping force can be created as adjoining blade springs slide against each other, and the chord vibrations of the chain are damped.

In recent applications of a blade tensioner, a large demand has emerged for the appearance of a blade tensioner capable of applying an even greater damping force to the chain. However, in the case of the aforementioned conventional blade tensioner, the damping force is typically created only by means of sliding resistance between the stacked blade springs. Thus, the aforementioned conventional structure has limitations in terms of improvement of damping force.

Summary of the Invention

In an aspect of the invention, the tensioner may be provided with a base and an arcuately-shaped blade shoe having a sliding face against which the chain slides as well as a base part and a tip part. The base part of the blade shoe may be supported by the base in such a manner that the base part can pivot freely and the tip part may be provided in such a manner that it can slide freely on a sliding face created on the base. A friction material can be provided at the contact part between the tip part and the sliding face. For example, the friction part may be inserted into the tip part of the blade shoe. Several plate-spring-like blade springs can be provided on the reverse side of the chain sliding face of the blade shoe, wherein their respective edge parts are inserted into slots created respectively at the base part and the tip part of the blade shoe in order to apply a spring force to the blade shoe.

According to an aspect of the invention, when chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe, not only can a damping force be created as adjoining blade springs slide against each other while the respective blade springs in the blade shoe are subjected repeatedly to elastic deformation and return deformation, but great sliding

resistance can also be created as the friction material at the tip part of the blade shoe slides on the sliding face of the base, so that the damping force of the blade tensioner can be further improved by the sliding resistance.

In another aspect of the invention, the tensioner may be provided with a chain sliding face against which a chain slides, an arcuately shaped blade shoe, a base having a sliding face which allows a base part of the blade shoe to pivot freely and a tip part of the blade shoe to slide freely and a friction material provided on the sliding face, and several plate-spring-like blade springs provided on the reverse side of the chain sliding face of the blade shoe, wherein their respective edge parts can be inserted into slots created respectively at the base part and the tip part of the blade shoe in order to apply a spring force to the blade shoe.

According to an aspect of the invention, when chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe, not only can a damping force be created as adjoining blade springs slide against each other while the respective blade springs in the blade shoe are subjected repeatedly to elastic deformation and return deformation, but great sliding resistance also may be created as the tip part of the blade shoe slides against the friction material on the sliding face of the base, so that the damping force of the blade tensioner can be further improved by the sliding resistance.

In yet another aspect of the invention, the blade tensioner may be provided with a chain sliding face against which the chain slides, an arcuately shaped blade shoe, a base having a sliding face which allows the base part of the blade shoe to pivot freely and the tip part of the blade shoe to slide freely, and several plate-spring-like

blade springs provided on the reverse side of the chain sliding face of the blade shoe, wherein their respective edge parts are inserted into slots created respectively at the base part and the tip part of the blade shoe in order to apply a spring force to the blade shoe. In addition, a friction material can be provided at the base parts of the respective slots of the blade shoe where they contact the blade springs.

According to an aspect of the invention, when chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe, not only may a damping force be created as adjoining blade springs slide against each other while the respective blade springs in the blade shoe are subjected repeatedly to elastic deformation and return deformation, but great sliding resistance can also be created as the blade spring or system slides against the friction materials provided at the bottom of the respective slots of the blade shoe, so that the damping force of the blade tensioner can be further improved by the sliding resistance. The friction materials may also be inserted into the base parts of the respective slots of the blade shoe.

According to another aspect of the invention, the blade tensioner may be provided with an arcuately shaped blade shoe having a sliding face against which a chain slides, a base wherein a base part of the blade shoe is provided in such a manner that it can pivot freely, and a plastic sliding block is provided which allows the tip part of the blade shoe to slide freely. Several plate-spring-like blade springs may be provided on the reverse side of the chain sliding face of the blade shoe, wherein their respective edge parts are inserted into slots created respectively at the base part and the tip part of the blade shoe in order to apply a spring force to the blade shoe.

According to an aspect of the invention, when chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe, not only may a damping force be created as adjoining blade springs slide against each other while the respective blade springs in the blade shoe are subjected repeatedly to elastic deformation and return deformation, but great sliding resistance can also be created as the tip part of the blade shoe slides on the plastic sliding block, so that the damping force of the blade tensioner is further improved by the sliding resistance.

In any of the aspects of the invention, the friction material may be provided by means of bonding, welding, or insert-molding, and it is desirable that it be configured using rubber, plastic, or friction paper.

Brief Description of the Drawings

Figure 1 is a side view of a blade tensioner in accordance with an aspect of the present invention;

Figure 2 is a side view of a blade tensioner in accordance with another aspect of the present invention;

Figure 3 is a side view of a blade tensioner in accordance with yet another aspect of the present invention; and

Figure 4 is a side view of a blade tensioner in accordance with another aspect of the present invention.

Detailed Description

Figure 1 shows a blade tensioner in accordance with an aspect of the present invention. As shown in Figure 1, the blade tensioner 1 is configured with a blade shoe 2 having an arcuately shaped chain sliding face 2a, several blade springs 3 stacked on the reverse side of the chain sliding face 2a of the blade shoe 2 in order to apply a spring force to the blade shoe 2, and a base 4 for

supporting the blade shoe 2.

Slots 21a and 22a are created at a tip part 21 and a base part 22 of the blade shoe 2, and respective edge parts 3a and 3b of the blade springs 3 are inserted into slots 21a and 22a. In addition, concave parts 21b and 22b are created in the respective slots 21a and 22a in order to avoid interference with the edge parts 3a and 3b of the blade springs 3.

Bolt holes 42 and 43 are created in the base 4 in order to insert the attachment bolts used to install the blade tensioner 1 into an engine. A sliding face 41 against which the tip part 21 of the blade shoe 2 can slide while remaining in contact with it is created at the tip of the base 4, and a pin 25 supporting the base part 22 of the blade shoe 2 while allowing it to pivot freely is fixed by one end near the center of the base 4.

Friction material 5 is provided at the tip part 21 of blade shoe 2 where it contacts with the sliding face 41 of the base 4. The friction material 5 is attached to the tip part 21 by means of bonding, welding including burn-in, or coating, or it may be buried into the tip part 21 by means of an insert-molding method simultaneously with the formation of the resin for the blade shoe 2. In addition, although nitrile rubber can be utilized for the friction material 5, silicone rubber is preferable from the viewpoint of thermal tolerance and abrasion resistance. In addition, nylon 66 may also be utilized. Furthermore, a friction paper commonly utilized as a friction material may also be utilized.

In the case of a blade tensioner 1 with this kind of configuration, when chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe 2, the respective blade springs 3 in the blade shoe 2 are subjected repeatedly to elastic deformation and return deformation as the blade shoe 2 deforms. As a

result, adjoining blade springs 3 slide against each other and create a damping force. Furthermore, in such case, the friction material 5 provided at the tip part 21 of the blade shoe 2 slides on the sliding face 41 of the base 4 as the blade shoe 2 deforms, and great sliding resistance is created. The damping force of the blade tensioner 1 is further improved by such sliding resistance.

As described above, the blade tensioner 1 pertaining to an aspect of the invention offers an effect that because a friction material 5 is provided at the tip part 21 of the blade shoe 2, the damping force of the blade tensioner 1 can be improved due to the sliding resistance created as the friction material 5 slides on a sliding face 41.

Figure 2 shows a blade tensioner 1 in accordance with another aspect of the present invention. In Figure 2, the same symbols as those in Figure 1 indicate the same parts or the equivalent. This aspect of the invention is different from the aforementioned aspect of the invention in that a friction material 5' is provided on the sliding face 41 of the base 41.

When chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe 2, not only is a damping force created by the resistance created as the adjoining blade springs 3 slide against each other, but the tip part 21 of the blade shoe 2 also slides against the friction material 5' on the sliding face 41 as the blade shoe is deformed, and great sliding resistance is created. The damping force of the blade tensioner 1 is further improved by such sliding resistance.

The blade tensioner 1 pertaining to an aspect of the invention offers an effect that because friction material 5' is provided on the sliding face 41 of the base 4, the damping force of the blade tensioner 1 can be improved due to the sliding resistance created as the tip

part 21 of the blade shoe 2 slides against the friction material 5'.

Figure 3 shows a blade tensioner 1 in accordance with yet another aspect of the present invention. In Figure 3, the same symbols as those in Figures 1 and 2 indicate the same parts or the equivalent. This aspect of the invention is different from the aforementioned aspects in that friction materials 5'' are provided at the base parts of respective slots 21a and 22a of the blade shoe 2 where they contact the blade springs 3.

When chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon the blade shoe 2, not only is a damping force created by the resistance as adjoining blade springs 3 slide against each other, but the blade spring 3 of the bottommost layer also slides against the friction materials 5'' provided at the base parts of the slots 21a and 22a, and great sliding resistance is created. The damping force of the blade tensioner 1 is further improved by such sliding resistance.

The blade tensioner 1 pertaining an aspect of the invention offers an effect that because friction materials are provided at the base parts of the respective slots 21a and 22a created at the tip part 21 and the base parts 22 of the blade shoe 2, the damping force of the blade tensioner 1 can be improved due to the sliding resistance created as the respective edge parts 3a and 3b of the blade springs slide against the friction materials 5''.

Figure 4 shows a blade tensioner 1 in accordance with an aspect of the present invention. In Figure 4, the same symbols as those in Figures 1 through 3 indicate the same parts or the equivalent. This aspect of the invention is different from the aforementioned aspects in that the sliding face 41 which contacts the tip part 21 of the blade shoe 2 is created on a plastic sliding block 45. The sliding block 45 is fixed to the tip of the base 4 using

screws. It is desirable to use nylon 66 as a plastic material to create the sliding block 45.

When chord vibrations caused by thrashing of the chain and/or fluctuation of tension act upon blade shoe 2, not only is a damping force created by the resistance created as adjoining blade springs 3 slide against each other, but the tip part 21 of the blade shoe 2 also slides on the sliding face 41 of the sliding block 45, and great sliding resistance is created. The damping force of the blade tensioner 1 is further improved by such sliding resistance.

The blade tensioner 1 pertaining to the above aspect of the invention offers an effect that because the plastic sliding block 45 is provided on the base 4, the damping force of the blade tensioner 1 can be improved due to the sliding resistance created as the tip part 21 of the blade shoe 2 slides against the sliding block 45.

Furthermore, although it is not illustrated, any of the aforementioned aspects of the invention may be combined as needed in order to realize a blade tensioner with further improved damping force.